

Amphion

Integrated Drilling Control System



The Amphion integrated drilling control system

NOVOS – enabled: The NOVOS reflexive drilling system provides unmatched control, consistency, and value as the industry's only reflexive drilling system, automating repetitive drilling activities and optimizing your drilling program. The open automation platform allows drillers to focus on consistent process execution and safety, and benefits operators by optimizing drilling programs. Custom apps help configure NOVOS specifically for your crew and processes.

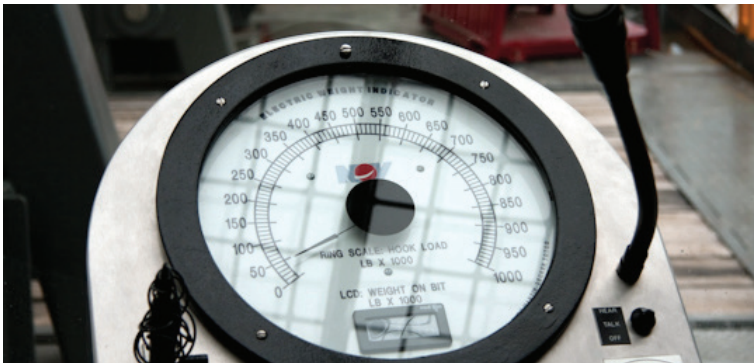
Advanced technology: The Amphion™ integrated drilling control system is a high-availability integrated rig control system for managing, controlling, and monitoring rig floor equipment in independent and activity-based operations. The system is designed to allow operators to focus on drilling, tripping, and stand-building processes by providing an efficient and intuitive rig floor command center.

Interactive controls: The Amphion integrated drilling control system is interactive through the use of color-graphic data and control screens viewed on any of the Amphion touchscreens integrated into the operator workstations. Touchscreens allow the driller, assistant driller, or pipehandler to supervise and control all drilling-related functions.

Multi-tool control cabinet: The main elements of the system are the multi-tool control cabinet, which houses control modules and network devices, one or more operator workstations, and one or more control modules to drive the rig equipment. All modules include an Amphion tool controller, communication hardware, and user software interface functionality. The design avoids single point failures through a robust network with redundant touchscreens running in parallel.

Features and benefits

- **Drives down rig operation and maintenance costs**
- **Increases safety overall by streamlining and automating rig operations**
- **Automates several significant rig tasks and centrally positions driller**
 - Displays information concisely and functionally, fostering quick comprehension and feedback
- **Improves decision-making, response time and safety with alarms and messaging**
 - Allows simultaneous monitoring of multiple pieces of equipment on one screen
 - Enables continuous power management of well construction machine
- **Enhances collaboration between offsite drilling contractors/operators and the rig crew**
- **Eases maintenance and troubleshooting**
 - Facilitates troubleshooting with self-diagnostics of system components
 - Automates rig tasks to reduce human error
 - Communicates situations effectively to rig personnel through feedback loops
 - Includes data logger for troubleshooting and improving operations
- **Enables effective scenario training with simulation capabilities**
- **Provides seamless control of rig operations and allows driller to effectively supervise and control all aspects of drilling operations**
- **Offers reliability**
 - Employs user-friendly interfaces and field-proven technology
 - Improves reliability with high degrees of redundancies and advanced diagnostics that simplify troubleshooting
- **Eases installation, commission, maintenance, support and repair by dramatically reducing number of components and software**
 - Allows for special features without additional hardware
 - Utilizes standard software modules that do not require specialized software knowledge, licenses or packages
 - Grows with rig requirements or scales down with equipment removal
 - Allows remote access by offsite personnel for troubleshooting assistance
- **Provides comfortable, ergonomic work area**



Equipment managed by Amphion

- Top drive
- Drawworks
- Mud pumps
- Drill-Force VFD





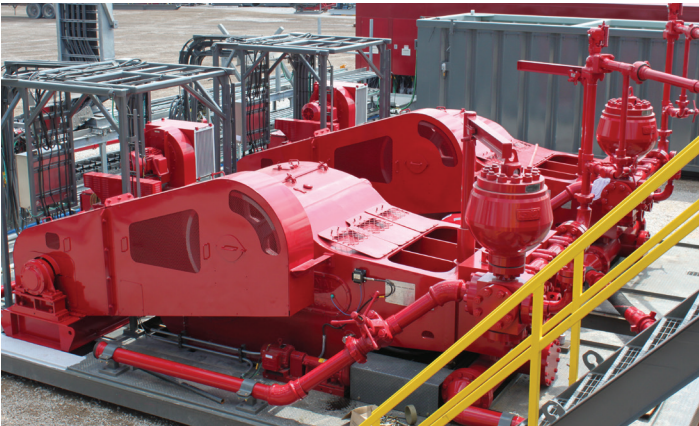
Top drive

- Link tilt Monitoring System
- Soft speed II ready to fight stick-slip oscillations
- Twister direction drilling included
- Twister ready
- Directional drilling features available
- Enhanced alarm and diagnostic capabilities
- HMI enhances operator messaging
- Top drive and VFD status diagnostics



Drawworks

- Block control including crown and floor protection and additional operation stop points
- Brake capacity test capabilities
- Superior auto-drilling based on delta P, ROP, weight on bit and drill torque
- Enhanced alarm and diagnostic capabilities
- HMI enhances operator messaging
- Zone management



Mud pumps

- Auto-starting and enhanced monitoring of auxiliaries
- Pause/resume feature
- Grouping and syncing of mud pumps
- Enhanced alarm and diagnostic capabilities
- HMI enhances operator messaging
- Process driven consolidated operator screens



Drill-Force™ VFD (three versions)

- LT** (air-cooled Land Type), **AC** (air-cooled), **WC** (water-cooled)
- Air-cooled land models Drill Force LT & LS
 - Offshore models Drill-Force AC (air-cooled) and WC (water-cooled)
 - Complete closed-loop rig control
 - Isolated main bus and motor cable termination sections
 - Advanced diagnostic monitoring
 - 600/690 generator controls and switchgear that meet the latest global requirements
 - Drilling experience drives expertise and pulls together companies including Baylor™, Ross Hill™, IPS™ (Integrated Power Systems) and Tech Power™ Controls

The heart of the system is the Multi-Tool Control (MTC) cabinet, which houses control module and network devices.



MTC

Multi-Tool Control cabinet

The MTC can support up to 12 tool controllers known as single board computers (SBCs) and is capable of controlling all NOV manufactured equipment as well as integrating customer-specified third party equipment requirements. Each SBC incorporates control screens, diagnostics, alarm and logging functions, all easily accessible via standard touchscreens. All of this technology fits on a removable flash card.

Features

- Single cabinet
- Supports up to 12 controls per MTC; 5 for wall-mounted station
- Built-in diagnostic HMI for system troubleshooting
- Dual redundant power supplies with alarm support
- Built-in ventilation
- Built-in isolation with lockout facility
- Additional MTCs can be added
- Wireless access point

Benefits

- Easily accessible
- Smaller footprint
- Easier maintenance, rig-up and troubleshooting
- Versatile
- Field-proven



Touchscreen HMI

Features

- Concise, activity-based information
- Response time of 50-200 ms
- Color graphics and displays
- Integrated control buttons and knobs
- Multiple equipment views on single screen
- User-selectable information displays
- Up to four touchscreen HMI screens
- Multiple levels of HMI redundancy
- Rig operation allowed from each screen
- Units of measurement can be switched

Benefits

- Optimizes actions
- Allows easy monitoring
- Improves decision-making and responsiveness
- Aids comprehension and reading speed
- User-friendly
- Increases safety
- Facilitates rig operations and integration

SBC - Single board computer Amphion SBC's

Features

- Industry standard off-the-shelf embedded controller
- Real time controller with 20 ms cycle time
- Profibus communication for machine control
- All software and screens reside on removable flash card
- All SBCs are interchangeable
- No special software licenses or packages required
- Open platform, Linux™ and Java™-based
- Simple web server for HMI display
- All controls, interlocks and indications for miscellaneous rig floor equipment
- Third-party integration
- Alarm and data-logging

Benefits

- State-of-the-art
- Field-proven
- Reduces hardware required
- Reduces complexity with simplistic approach to system design
- Versatile
- Easily transported
- User-friendly



Workstation-Chair/Console SBC

Features

- Provides all communication for operator inputs and outputs
- New and improved chair
- Most advanced stand-up or sit-down operation
- Up to seven adjustments to maximize operator comfort
- Improved "joystick centric" ergonomics
- Integrated talk back system
- Supports CCTV and cabin controls integration
- Easily expandable
- Weight indicator

Benefits

- Facilitates rig operations and integration
- Ergonomic and comfortable
- Versatile
- User-friendly and intuitive
- State-of-the-art displays and workstation



National Oilwell Varco has produced this brochure for general information only, and it is not intended for design purposes. Although every effort has been made to maintain the accuracy and reliability of its contents, National Oilwell Varco in no way assumes responsibility or liability for any loss, damage or injury resulting from the use of information and data herein. All applications for the material described are at the user's risk and are the user's responsibility.

Corporate Headquarters
7909 Parkwood Circle Drive
Houston, Texas 77036
USA

Rig Technologies Headquarters
10353 Richmond Avenue
Houston, Texas 77042
USA